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14. ABSTRACT

Operational Art as defined in U.S. Joint Doctrine is an accepted process for use by operational commanders to visualize how to most efficiently and effectively employ military capabilities to achieve a desired objective. Within Operational Art are three accepted factors in which all other considerations are defined and employed. They are space, time and force. This paper argues that there is a fourth operational factor integral to the process, that of information. Specifically, information in the most inclusive terms, encompassing all disciplines in the military that use, manipulate and employ this fourth factor. While recent advances in technology have brought information's role to the forefront, information has always played a cornerstone role in operational art, alongside of the factors of space, time and force. This paper supports the assertion through examination, comparison and use of historical example of information's role in Operational Art.

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The Fourth Factor: The Case for Parity of "Information" as an Operational Factor With Space, Time & Force

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the U. S. Navy.

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31 October 2008

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Abstract

Operational Art as defined in U.S. Joint Doctrine is an accepted process for use by operational commanders to visualize how to most efficiently and effectively employ military capabilities to achieve a desired objective. Within Operational Art are three accepted factors in which all other considerations are defined and employed. They are space, time and force. This paper argues that there is a fourth operational factor integral to the process, that of information. Specifically, information in the most inclusive terms, encompassing all disciplines in the military that use, manipulate and employ this fourth factor. While recent advances in technology have brought information's role to the forefront, information has always played a cornerstone role in operational art, alongside of the factors of space, time and force. This paper supports the assertion through examination, comparison and use of historical example of information's role in Operational Art.

"Thus, what enables the wise sovereign and the good general to strike and conquer, and achieve things beyond the reach of ordinary men, is FOREKNOWLEDGE."

Sun Tzu - The Art of War

Introduction

Since time eternal and humans first entered organized conflict with one another, aggressors and defenders alike have had to consider certain factors that defined the complex reality in which the art of war was shaped. Through the centuries, the factors of space, time and force have become the accepted cornerstones of operational art by the scholars and professionals who have studied and written on the subject. Over time, the role of information has been considered in the operational art equation in various forms. In its most rudimentary form, information is defined in Merriam-Webster's dictionary as "the communication or reception of knowledge or intelligence."[1] This seemingly benign concept/definition quickly becomes extremely difficult to define in terms of its role on the modern battlefield. Because of this complexity, a number of approaches to defining information have been taken. Current U.S. doctrine describes information in terms of an "information environment," further divided into three interrelated dimensions.[2] Within this environment exist disciplines such as Information Operations (IO) and Intelligence (INTEL), subsets of information created to manage specific areas of the overarching concept of information. In recent decades, students of operational art have alluded to the premise that information and the systems that support its use should exist on an equal plane with space, time and force as a factor in operational art.[3] While the specific placement of information in the equation varies somewhat, the common idea among the differing views is information's major role in formulating operational art.

Mastery of the operational arts for operational-level leadership is dependent on their understanding of the role of information in the battle space. In an attempt to (begin to)

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understand the expanse of information and for purposes of this discussion, the term 'information' will be used in the context of Joint Publication 3-13, the joint doctrine for Information Operations. In part, JP 3-13 defines the "information environment" as:

> The information environment is the aggregate of individuals, organizations, and systems that collect, process, disseminate, or act on information. The actors include leaders, decision makers, individuals, and organizations. Resources include the materials and systems employed to collect, analyze, apply, or disseminate information. The information environment is where humans and automated systems observe, orient, decide, and act upon information, and is therefore the principal environment of decision making. Even though the information environment is considered distinct, it resides within each of the four domains. The information environment is made up of three interrelated dimensions: physical, informational, and cognitive[4]

This definition is inclusive and not limited to a specific discipline or sector of information. Further, JP 3-13 continues the discussion of information as it exists in three separate areas of physical, informational and cognitive dimensions. Examination of this expansive role in warfare may suggest that <u>information's proper placement in operational art is more accurately defined as an operational factor, equivalent (and indivisible) to that of space, time and force</u>. Contributing to that suggestion may be the recent exponential increases in the ability to collect and assess information, bringing information's role to the forefront of warfare and the art surrounding it. Specifically, recent methods used to objectively quantify and qualify information appear to validate a fact that information can and should be used by the operational commander on all levels of the planning, decision making and execution. Most significantly, the expansive nature of information demonstrates, in its relationship to space, time and force, that it is the fourth qualitative factor in the "equation" whose presence (or lack of) will either directly or inversely affect the other three factors. A brief examination of theory, doctrine and relevancy to current and historical events will help to illustrate information's critical role in operational art

and the apparent necessity to treat it with the weight and importance of an operational

factor, not merely as an instrument of non-kinetic power or in narrowly defined terms of

(formerly accepted) "information warfare."[5]

Background

"The only really practical man is one who is grounded in theory."

Frederick A. Mahan

The sheer volume of information and the speed at which it can be communicated have

exponentially increased the volume available to the operational commander. Naval War College

Professor Richard Crowell has culled an illustrative example that highlights the dilemma,

"In World War I, a field telephone could transmit 30 words per minute (wpm), World War II saw

60 wpm over a radio, in Vietnam the rate increased to 100 wpm via satellite, the 1991 Gulf War

processed 192,000 wpm and by 2010, wideband data links will be able to process 1.5 trillion

wpm- that is the equivalent of the entire Library of Congress every minute."[6] Because of the

expansive nature of information, military professionals have developed numerous disciplines to

parse the vast body of information available to the operational commander. Since the

Goldwater-Nichols Act of 1986, individual communities have formed within the joint war

fighting arena to address the sheer volume and complexity of information. All of these areas

have sought to rationalize the information factor and its potentially significant impact on a

commander's ability to accomplish their objective. For example, the Information Operations

(IO) community has made significant progress in organization and definition of information in

its core and supporting areas. The community's core areas include electronic warfare (EW),

computer network operations (CNO), psychological operations (PSYOP), military deception

(MILDEC), and operations security (OPSEC) and are supported by the areas of information

assurance, physical security, physical attack, counterintelligence, and combat camera. Further, there are three related military capabilities to IO which are Public Affairs (PA), Civil-Military Operations (CMO) and Defense Support to Public Diplomacy (DSPD).[7] Recognizing the significance of IO in operational art, Christopher Lamb, Senior Fellow at the Institute for National Security Studies at the National Defense University states, "More broadly, IO makes the military consider not only the physical assets of both sides but also their approach to decision making and how it affects the time, place, and way their physical capabilities are used."[8] Respected scholars of operational art, such as Dr. Milan Vego, have argued that information, because of this expansive nature, is unable to be quantified or qualified in a manner that is useful to the operational commander: "In general, the volume of information cannot be regulated; nor can one compensate for a lack of information. Information is also essentially indefinable in any meaningful way, unlike traditional operational factors."[9] Still others argue that the volume of information available to the operational commander has become so vast and detailed, that it often times reaches a point beyond the ability to analyze and employ. Martin Van Creveld argues that too much information or the inability of systems to put information into a useable form can not only make information of limited use, but can create great deal of confusion and increase the chance of failure at accomplishing one's objective.[10]

Despite the arguments to the contrary, information, in its most expansive sense and like traditional operational factors, can and must be addressed early in the stages of planning and execution. As discussed earlier, militaries have sought to break down this body into more manageable parts for study and employment. Each contains a subset or a number of subsets in the overarching information environment and has structured their communities to accomplish their role in operational art.   By breaking down each of these areas, professionals can define and

quantify a particular area of the expansive environment of information. The IO and INTEL

communities are examples who have demonstrated that information and the processes to manage

it does indeed become measurable both in terms of volume and quality in a meaningful way to

the operational commander. Specific examples of this measurement will be discussed in

following sections of this paper.

The question becomes: why dissect the placement or role of information environment in

theory? What is the relevance of placing it on par with other operational factors and why not just

leave it as an enabling function, supporting the other three factors or as a more nebulous

"information environment" in which operational art occurs? Because the very essence of

operational art, that which "occupies an intermediate position between policy and strategy on

the one hand and tactics on the other," and is "aimed at accomplishing strategic or operational

objectives in a given theater,"[11] is defined and practiced at a level of equal magnitude with the

other operational factors. Factors in which the commander must acknowledge and seek to

balance in order to accomplish his objective. Because of information's fundamental and

expansive role in operational art it should be on par with space, time and force as an operational

factor. Failure to recognize this truth at the foundation level of assessment is to significantly

increase the risk of defeat and an inability to accomplish one's objective.

Discussion

To examine the assertion of the fundamental role that information plays in operational art

and the associated body of research and commentary, it will be helpful to focus on a few areas

that directly address the roles of information as an operational factor. The specific areas of

interest and examination are:

1. Discussion of the <u>common characteristics</u> that information shares with the traditional factors of space, time and force.

2. Discussion of the relationship of information in the "equation" of operational planning and execution (proportional and inversely proportional relationships).

3. The role of information (from a view of the IO community's core and related capabilities) in an illustrative historical example.

Characteristics of Operational Factors

Operational factors are the variables with which all operational commanders must seek to balance in order to successfully accomplish a military objective. Their importance is underscored in the words of Dr. Milan Vego, "These factors and, increasingly information, are pivotal for making sound decisions on all levels."[12] How a commander comprehends, assesses and executes the plan within the realm of these factors (and relative to his adversary) determines success or failure. In operational art, space, time, force and information share qualities which set them apart from other important but less substantial planning considerations, such as supporting structure and activities like operational or joint functions. Some of the characteristics shared by operational factors include:

- **Expansive in nature.** The factors cover massive concepts that are broad and inclusive by their makeup. Information as a whole, as compared to less fundamental 'operational functions' (command & control, intelligence, fires, movement, and maneuver, protection and sustainment), is a primary factor that other concepts in operational art seek to explain and balance.[13]

- **Closely interrelated with other factors.** They share a relationship of proportionality or inverse proportionality with the other operational factors. It is the relationship between the operational factors the commander seeks to 'balance' to bring about the desired end state.

- **Neutral in nature**. The factors (including information) are neither associated specifically with an aggressor or defender, they are independent factors that <u>all</u> armed forces and their leaders must consider and balance.

- **Measurable.** The factors are measureable in either empirical or in terms of relative comparison. Comparison can be with the enemy's factor or in historical relativity with one's own assessment. While it is important to note that some factors are more accurately measured than others, all at least have rudimentary forms of measurement (these differences will be addressed in later sections).

Information shares these qualities with space, time and force. Recent evolution of systems and the ability to communicate the vast amount of information available have certainly highlighted its position in the hierarchy of operational considerations, but arguably information has always been a part of the equation. In following sections this paper will discuss in further depth, these relationships and common features.

The Equation

Current doctrine and historical examples point to the operational commander's necessity to balance the operational factors to achieve strategic and operational objectives through considering the questions of ends, ways and means. The correlation of balancing these factors and military success has been tested and validated over centuries of war, illustrated in the examples of Napoleon, Nelson and others. Articulated in one form or another, scholars of operational art understand the importance of assessing these factors and making decisions based

on their relative comparison. Dr. Vego asserts, "A commander's need to fully understand the factors of space, time and force and then balance them against the objective is as old as warfare itself."[14]

Successful commanders have known that proper assessment of the factors directly effects the employment of his forces. Key to his success, the commander maintains freedom of action by seeking the most advantageous space, time, type of force and the necessary information to efficiently and effectively employ these forces.   Information (or the lack of it) can radically affect the relationship of space, time and force and is clearly the fourth factor that allows the commander to act with reasonable confidence that he will accomplish his objective.

The ability to quantify the operational factors varies but all directly impact a commander's freedom to act. Generally, the factors of space and time have the greatest degree of empirical certainty compared to that of force. While some measures of force are possible, too many variables affecting the real fighting strength of an armed force do not allow a highly refined measurement, as compared to that of factors of space and time.[15] Information shares the predicament of factor force: while there are some distinctive measures both in relative and empirical sense (which will be discussed in following sections), it can be challenging (but not impossible) to derive measurements useful to the operational commander. This challenge does not suggest that an operational commander should ignore or minimize the impact of information; to do so would be a great risk.[16]

Relationships between these factors can run the spectrum of exceedingly complex to that of being relatively simple. The following paragraphs will examine some of the basic relationships of operational factors in relation to establish proportional or inversely proportional effect on another factor. Later sections will provide an illustrative examples found in history.

The following discussion defines only the most rudimentary relationships and these relationships

can vary significantly because of other variables:

Force-Space: generally <u>proportionally related</u>. If other factors remain constant, the larger the space to be held/attacked, the larger the amount of force required.

Space-Time: generally <u>proportionally related.</u> If the force remains constant, an increase in space will require more time.

Force-Time: general <u>inversely proportional</u>. Again, if other variables remain the same, over a given constant space a greater force will take less time to accomplish its objective.

In this same manner, we can look at the relationships between information and the other

operational factors. While this is a simplistic look at the relationships, it is useful in establishing

the fact that information must be at the very bedrock of the conduct of operational art. Just as is

in the case of force, information has both a quantitative and qualitative aspect. When discussing

"more" information, the assumption will be that of greater volume <u>and</u> greater quality (accuracy,

timeliness, etc.). Again, these relationships assume a condition of ceteris paribus (all other

things being equal). A view of the basic relationships of information to space, time and force

are:

Force-Information: generally <u>inversely proportional</u>. In the example of targeting information: it is often necessary to use less force when in possession of more and higher quality information to meet an objective (destruction of a target)

Space-Information: <u>slightly proportional</u>. This is the least definitive of all factor relationships. More and better quality information could lend a commander the ability to maximize the use of space (i.e. defend/attack/hold a greater physical area).

Time-Information: generally <u>inversely proportional</u>. The more information available to the commander, potentially less time required to accomplish the objective (reaching desired end state faster). This can be true in the decision making process as well: higher quality information leads to faster, more accurate decisions.

The relationships listed above are rudimentary, but they are important in establishing how

information, included as an operational factor, can affect the "balance" of a commander's

decision making process. While these relationships can be influenced by many other variables, these four factors are at the heart of considering the ends, ways and means to reaching an operational objective.[17]

Information Measurement

To be of use to the operational commander, it is imperative that information have some form of measurement or relative comparison in assessing its quantity or quality. It has been argued that information should not be considered an operational factor due to the difficulty in quantifying and qualifying information in a meaningful way for use by the operational commander as supported by Dr. Vego's statement, "Information is also essentially indefinable in any meaningful way, unlike traditional operational factors."[18] While compared to measurement of the factors of space and time this may be the case, there are still effective argument for the ability to measure both information and force.

In recent decades, various communities responsible for and specializing in the collection, evaluation and dissemination the various forms of information have made progress in defining methods to qualify and quantify information. Communities like that of IO and INTEL have instituted practices for measurement and this method is reflected in current joint doctrine and other resource material within the Department of Defense.[19] In one example, information disciplines are associating Measures of Performance (MOP) and Measures of Effectiveness (MOE) to gauge the level and quality of various forms of and the processes involving information management.[20]

The joint community of Information Operations (IO) professionals has developed a framework for establishing MOPs and MOEs and the relationship between the two. While recognizing the inherent challenges associated with measuring information and its associated

operations, the IO community has established guiding principles for building relevant MOPs and

MOEs.[21] Specifically and as excerpted from Joint Publication 3-13, these principles of ensuring

relevancy include:

> (1) **Ends Related.** They should directly relate to desired effects required to
> accomplish objectives.
> (2) **Measurable.** Effectiveness or performance is measured either quantitatively
> or qualitatively. In order to measure effectiveness, a **baseline** measurement must
> be established prior to the execution, against which to measure system changes.
> (3) **Timely.** The required feedback time should be clearly stated for each MOE
> and/or MOP and a plan made to report within specified time periods.
> (4) **Properly Resourced.** The collection, collation, analysis, and reporting of
> MOE or MOP data requires personnel, budgetary, and materiel resources. IO
> staffs should ensure that these resource requirements are built into the IO plan
> during its development.[22]

By adhering to these guidelines, IO professionals are able to reasonably quantify and qualify

their critical core capabilities within the information environment (PSYOP, EW, MILDEC,

OPSEC and CNO). While these areas are relatively specific examples in the information

environment, they are ones of great concern to the operational commander in both the kinetic

battlefield and the more nebulous realm of "soft power."[23] Please see Appendix A (p. 20) for a

specific example on how the Information Operations community has linked MOPs and MOEs.[24]

The Chairman of the Joint Chiefs of Staff has developed another method of measuring

information and its usefulness at the strategic, theater-strategic, operational and tactical levels for

warfare. The most recent U.S. Joint Chiefs of Staff Manual specifying the Universal Joint Task

List (UJTL, CJCSM 3500.4E, 25 Aug 08) was specifically created and modified to define the

range of capabilities within the armed services and the associated training required to maintain

those capabilities.   Enclosure B of the UJTL gives a very detailed procedure for establishing

standards through the use of measures and criteria: "A standard provides a way of expressing the

acceptable proficiency that a joint organization or force must perform under a specified set of

conditions. A standard consists of one or more measures for a task and a criterion for each measure."[25] This is further broken down in detail for each standard/measure/unit to be measured. The following is an unclassified example from the Joint Doctrine Electronic Information System (JDEIS), the authoritative database from the CJCS's Joint Electronic Library. This illustration shows IO-related line items (from task OP 5.6.1 "Integrate Operational Information Operations") as they appear in the UJTL showing measure number, unit of measure and item to be measured:[26]

M1	Instances	Of uncoordinated operational IO element or activity actions causing disruption or delay of US or allied plans and objectives.
M2	Hours	To modify operational level IO plans and actions due to operational contingencies.
M3	Instances	Of US or allied plans or operational objectives being delayed, defeated, or disrupted due to adversary offensive IO actions.
M4	Percent	Of operational IO cell nominated (targets) struck with lethal or nonlethal means during the timeframe planned for in the IO appendix or other planning document.
M5	Days	To conduct battle damage assessment of IO (targets) struck with lethal and nonlethal means after receipt of information.
M6	Percent	Of operational IO cell nominated (targets) restruck when recommended by battle damage assessment reporting from initial strike.
M7	Percent	Of operational IO objectives verifiably achieved.

This level of detail is defined for all information related tasks required the strategic, operational and tactical levels of war. It covers standard forms of information actions, across all of the recognized communities responsible for information related duties, some of which include INTEL, IO and PA.   While this type of measurement only begins to quantify and qualify information and related methods of use, it refutes the claims that information cannot be quantified to be of significant use to the operational leader.

1973 Arab-Israeli War**: A Consummate Use of Information to Achieve an Objective**[27]

The 1973 Arab-Israeli War is a shining example of how information (in the expansive sense) acts as a central factor in operational art, directly affecting the other operational factors of

space, time and force. Because of the varied and skilled use of information by Egypt's strategic

and operational leadership, a substantially inferior Egyptian armed forces was able to accomplish

its operational and strategic objectives against a far superior regional foe.

Despite significant disadvantages in force (the Israeli Defense Force (IDF) was

recognized as the strongest military power in the Middle East), space (the Sinai Peninsula,

formerly held by Egypt, was controlled by Israel as a result of the decisive military action of the

Six Day War in 1967 and had been significantly reinforced defensively in the successive years)

and time (the IDF required but a forty-eight hour notice to mobilize its reserve force; an interval

practically guaranteed by Israeli Military Intelligence). What ensued was a masterful use of

information on several levels that would magnify Egyptian force, allow recapture of its territory

(space) and exceed all expectations on time to accomplish their objectives. In one relatively

short campaign, the Egyptians effectively used information and its associated disciplines as an

operational factor. They used the disciplines of INTEL, three of the five core capabilities of

modern IO (PSYOP, MILDEC and OPSEC) and PA with forethought and meticulous discipline

to ensure their freedom of action and to accomplish both operational and strategic objectives.

The following is an illustrative breakdown of several of the uses of information to compensate

for the Egyptian's inferior position in respect to the Israelis position of space, time and force (per

the inverse/proportional relationships discussed above):

1. **Military Deception**: an extremely elaborate operation that hid the Egyptian military's plan to rapidly cross the Suez and occupy the Sinai territory. It involved desensitizing Israel's intelligence organization, physically hiding troop movements/placement and placement of decoy bridges to lessen overall effect of the IDF's air strikes. Information factor effects:
   a. **Time**: extremely successful in covertly massing forces and crossing the Suez. Speed of strike negated Israel's ability to mobilize its reserve force effectively.
   b. **Force**: enabled a much weaker Egyptian army to take and hold territory as planned despite facing a stronger military foe.
   c. **Space**: initial drive of Egypt's forces capture the planned 10-15km into the Sinai.

2. **Psychological Operations**: likely the single most influential tool against the Israelis.   By a plan, "aimed at inflicting the heaviest losses on the enemy," the Egyptians accomplished a form of intimidation by making continued war's price for Israel "to high for him to pay," in terms of loss of life.[28] It changed the way Israel viewed the balance of power. Information use directly influenced the following:
    a. **Force**: despite the inferiority of the Egyptian forces, they were strong enough to reduce Israel's will to continue the fight.
    b. **Space**: ultimately lead to Israel's return of the Sinai territory to Egypt

3. **Operations Security**: kept a massive military engagement a secret (for months prior) from arguably one of the finest intelligence agencies in the world. This was the key to the entire operation. Examples of information directly effecting military operations:
    a. **Time**: without the secrecy, the operation would have failed as Israel directed their forces to the Suez.
    b. **Force**: see military deception results above
    c. **Space**: see military deception results above

4. **Intelligence**: phenomenal knowledge of the enemy, his order of battle, tactics and operational level of planning/response. Because of the in-depth level of INTEL, Egypt was able to plan accordingly, knowing fully what to expect and when to expect it. Another key to success.
    a. **Time**: knew fully the amount of time they had to get across Suez, when to expect Israeli reinforcements
    b. **Force**: intimate knowledge of Israel's tactics; allowed Egypt to counter with air defenses and anti-tank tactics
    c. **Space**: fully understood the terrain and the lines of operation for self and enemy

5. **Public Affairs**: controlled the information flow across the region and internationally across the diplomatic and economic spectrums. Critical to accomplishing stated objectives of having US/USSR involved in the process.   Results exceeded expectations.
    a. **Time**: Egypt understood the critical window that they would have to influence the US and they succeeded
    b. **Space**: again, this area significant impacted the negotiations that returned the Sinai to Egypt.

While the example of the 1973 Arab-Israeli War is somewhat unusual in its nature as to

the significant level impact and wide variety of uses of information to shape the outcome, it

works well to illustrate information's role in "balancing" the other factors of operational art.

Had Anwar Sadat not factored information into the strategic and operational equation, Egypt

may never have regained the Sinai Peninsula or shifted the balance of power in the Middle East.

These proportional and inversely proportional relationships between the operational factors (to

include information) were profound and deserve attention from those who practice operational art.

Recommendations

Today's battlefield is more complex now than at any other point in the history of mankind. The amount of information available to the operational commander is staggering. Particularly over the last fifty years, the levels of information have not increased linearly but exponentially, in many orders of magnitude. What has not changed in a pure sense is the need to turn this information into something of use to the commander. In his book Command in War, Martin Van Creveld states, "The history of command can thus be understood in terms of a race between the demand for information and the ability of command systems to meet it. That race is eternal; it takes place within every military (and indeed nonmilitary) organization, at all levels and at all times." [29] What *is* different is that modern technology is facilitating the ability to draw into focus the body of information that has been previously large, mostly undefined and at times, nebulous.

The relationship of information and operational art exists at the most basic level. This intrinsic relationship makes it imperative for the commander at all levels of war to consider it at the first levels of planning and through all phases of war, to include "Phase 0" operations.[30] Specific reasoning for its use by the operational commander includes:

1. Information fully shares the qualities of the three accepted factors. Expansive and neutral in nature, it is interrelated to space time and force in an inseparable manner.

2. Information can be measured. It is an easy answer to say that information is such a large concept it cannot be quantified in a meaningful manner, this however, is simply not the case.

Communities of war fighting professionals such as IO, INTEL, and PA have refuted this notion and created very specific measures for the commander.

3. <u>Information can be qualified</u>. That is, better information can be culled from more general information and quality standards can be applied. At times, this measuring of the level of quality of information may only be done in comparison to one's own or that of the enemies, but comparative measures can be of significant help in the decision making process. The critical "take away" is that by qualifying information, the practioner begins to clarify the problem and lift the figurative "fog of war" that exists today.[31]

Information Operations, Intelligence, and Public Affairs (as communities directly linked to the factor of information) have just begun to scratch the surface of the larger task of fully defining and shaping the information environment. This meaningful endeavor continues to makes a difference on the battlefield and as refinements in methods and development of technology support their efforts continue, the product rendered to the operational commander will continue to improve. Recognition of the issues and the proper hierarchy is critical to ensuring achievement of the desired end state. Information is key to that end state.

Though an argument for information's role in the application of 'soft power' can be made, it is much larger that any single form of persuasion, weapon, fires or other operational function.[32] The information humans perceive, communicate and shape are as every bit omnipresent as the land and seas through which they pass (space), the actions they take (force), and the clock that measures time. The operational leader can ill afford to confine information to a narrow role or fail to recognize its full, pervasive presence in every facet operational art.

Conclusion

Information comes in many forms and is studied in many different disciplines within the military and this paper examines but a few. The examples are representative of the many areas in which humans continue, through analytical thought and modern technology, to try to shape the world in which they live. This attempt to control (mostly in a relative sense) freedom of action in the battle space of the operational level is best suited by recognizing the importance of information at the earliest stages of shaping and planning.

Success in any complex endeavor is determined largely by the science, procedure and rigor under which it is practiced and applied. The art of war is no different and requires the commander to use every tool available, including a sound framework in which to approach the highly complex problem that is war. By not including information as an operational factor, it is easy to be complacent, potentially attempting to bound a complex and ill-structured problem without all sides of the "cognitive box" intact.[33] If the method used to grasp such a problem is devoid of a factor, it incurs additional (and sometimes unacceptable) risk.

Operational art exists in an area that inter mingles science, knowledge, skill and experience and challenges the commander to use the full "pallet" of factors to construct his masterpiece.[34] To omit information as one of the "primary colors" leaves a work unbalanced and devoid of its full potential. Because of the extremely high price to be paid in blood and treasure of a nation, the art of war demands that practitioners make use of every tool available to avoid unnecessary loss of either.

End Notes

[1] *Merriam-Webster's Collegiate Dictionary,* 11th Edition (Springfield, MA, 2006), 641.

[2] The Chairman of the U.S. Joint Chiefs of Staff. *Joint Publication 3-13: Joint Doctrine for Information Operations* (Washington, DC, 13 February 2006), I-1.

[3] William G. Apigian. *Information Systems: The Fourth Operational Factor* (research paper: Newport, RI: U.S. Naval War College, Joint Military Operations Department, 2001), 17.

[4] The Chairman of the U.S. Joint Chiefs of Staff. *Joint Publication 3-13: Joint Doctrine for Information Operations.* (Washington, DC, 2006), I-1.

[5] Leah Armistead. *Information Operations: Warfare and the Hard Reality of Soft Power.* (Washington, DC, 2004), 18-21. Here, Armistead discusses the role of information as power, and specifically the relationships between IO and the narrower term of Information Warfare (IW). IW and its core areas have been absorbed into IO, recognizing the fact that IO spans all of the accepted phases of war.

[6] Richard M. Crowell. *Hung on the Old Bridge like Slaughtered Sheep.* (Newport, RI: 2008), 5-6.

[7] U.S. Joint Chiefs of Staff, *Joint Publication 3-13: Joint Doctrine for Information Operations*, II-8 – II-10.

[8] Christopher J. Lamb "*Information Operations as a Core Competency.*" *Joint Force Quarterly* No. 36 (2005): 89.

[9] Milan N. Vego, *Joint Operational Warfare, Theory and Practice* (Newport, RI: U.S. Naval War College, 2007), III-65.

[10] Martin V. Creveld. *Command In War* (Cambridge, MA: Harvard University Press, 1985), 267.

[11] Vego, *Joint Operational Warfare, Theory and Practice*, I-3, 4.

[12] Ibid., III-3.

[13] U.S. Joint Chiefs of Staff, *Joint Publication 3-0: Joint Operations*. Washington, D.C., 26 December 2006, III-1 – III-38. JP 3-0, Chapter III provides an in-depth definition and discussion of "operational or "joint functions."

[14] Vego, *Joint Operational Warfare, Theory and Practice*, III-3.

[15] Ibid., III-4.

[16] Creveld, *Command In War*, 265.

[17] U.S. Joint Chiefs of Staff, *Joint Publication 5-0: Joint Operations Planning*. Washington, D.C., 26 December 2006, IV-1,2.

[18] Vego, *Joint Operational Warfare, Theory and Practice*, III-65.

[19] U.S. Joint Chiefs of Staff, *Joint Publication 3-13: Joint Doctrine for Information Operations*, Washington, D.C.V-8, 9,10.

[20] Ibid., V-7, 8.

[21] Ibid., V-7.

[22] Ibid., V-7, 8.

[23] Joseph S. Nye, Jr., *Soft Power: The Means to Success in World Politics* (New York: Public Affairs, 2004), 5.

[24] U.S. Joint Chiefs of Staff, *Joint Publication 3-13: Joint Doctrine for Information Operations*, Figure V-2.

[25] Chairman of the Joint Chiefs of Staff, *Universal Joint Task Manual (CJCSM 3500.04E)* (Washington, D.C., 25 August 2008), B-B-1.

[26] U.S. Joint Chiefs of Staff, *Joint Doctrine Electronic Information System*, *Joint Electronics Library*; 18 June 08; available from (computers on .mil domains only): http://www.dtic.mil/doctrine/, accessed on 28 October 08. Note: by direction of the CJCSM 3500.04E, this is the primary authoritative source for UJTL items. These sections that were previously included in CJCSM 3500.04D, but are no longer distributed in print form.

[27] George W. Gawrych. *The 1973 Arab-Israeli War: The Albatross of Decisive Victory* (Fort Leavenworth, KS, 1996), 1-89.

[28] Anwar Sadat. *In Search of Identity* (Cairo Egypt: al-Zahra' lil-I'lam al-'Arabi, 1989), 81

[29] Creveld, *Command In War*, 1-3, 265.

[30] U.S. Joint Chiefs of Staff. *Joint Publication 5-0: Joint Operations Planning*, 35-38.

[31] Karl von Clausewitz, *On War*. Edited and Translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976)

[32] Nye, *Soft Power: The Means to Success in World Politics*, xiii.

[33] William J. Hartig, *Problem Solving and the Military Professional* (Newport, RI, 2007), 8

[34] U.S. Joint Chiefs of Staff. *Joint Publication 3-0: Joint Operations* (Washington, D.C., 2008), IV-2,3

EXAMPLE OF THE RELATIONSHIP BETWEEN MEASURES OF PERFORMANCE AND MEASURES OF EFFECTIVENESS

Capability	Measures of Performance (MOPs)*	Measures of Effectiveness (MOEs)**	Remarks
Psychological Operations (PSYOP)	Percentage of PSYOP products disseminated	Extent that PSYOP changed the demonstrated behavior of the target audience	Often necessitates further intelligence requirements
Electronic Warfare (EW)	Percentage of adversary command and control (C2) facilities attacked	Effect of attacks on adversary C2 facilities' ability to pass critical information	MOE requires a change in a detectable and measurable activity
Operations Security (OPSEC)	Percentage of identified compromises of critical information or indicators with OPSEC measures applied	Observed adversary actions indicating lack of foreknowledge of friendly operations	MOE requires collation of all leaked information and comparison with adversary actions
Military Deception (MILDEC)	Days between updates on effectiveness of deception plans	Specific adversary actions taken based on friendly deception activities	MOE requires an estimate of how the adversary is expected to react if they do and if they do not believe the deception
Computer Network Operations (CNO)	Percentage of tasked network attacks conducted	Effect of network attacks on target systems	MOE requires access to a measurable output or to the adversary's own reporting of the attack

*MOPs are derived from CJCSM 3500.04D, Universal Joint Task List (UJTL). Most MOP are answered by internal statistic generation.

**MOEs vary and are based on IO objectives and individual planned tasks.

Figure V-2. Example of the Relationship Between Measures of Performance and Measures of Effectiveness

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